

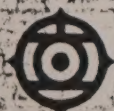
HITACHI

Model KP-120
Solid-state black-and-white TV camera

Model AP-120
AC adaptor

SERVICE MANUAL

OFFICE USE
ONLY.



Hitachi Denshi, Ltd.

TOKYO JAPAN



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MODEL KP-120

SOLID-STATE BLACK-AND-WHITE TV CAMERA SECTION

1. GENERAL

The Hitachi KP-120 is a solid-state black-and-white TV camera which employs a solid-state imaging device instead of conventional pickup tubes.

FEATURES

- * This camera features a MOS two-dimensional photo sensor array with 320 horizontal and 244 vertical picture elements, developed especially by Hitachi, as the solid-state imaging device, and this device improves the resolution and blooming characteristics.
- * The solid-state imaging device, ensures no deflection distortion or burning, and also a low level of lag. Moreover, the service life is prolonged and the reliability of the camera has been upgraded.
- * Besides the internal non-line-lock system, external sync may also be employed. The switchover to external sync is automatic with the supply of the external drive signal and so there is no need to operate any switches.
- * A picture is provided on the main camera unit simply by switching on the power, and operation is extremely easy.
In addition, a small size, light weight and a low level of power consumption are featured.
- * The KP-120 is most suited to applications where the fact that there is no deflection distortion can be used to maximum advantage. Such applications include test and measuring and graphic processing.
Furthermore, the model is ideal for special monitoring applications where full justice can be done to its long service life and high reliability.

2. SPECIFICATIONS

Solid-state imaging device	MOS-type 2-dimensional photo sensor array with 320 horizontal and 244 vertical picture elements
Image size	6.6 x 8.8 mm ² (equivalent to 2/3-inch Vidicon)
Sync system	Asynchronous to power (internal/external sync automatically selectable)
Scanning system	Progressive scanning
Scanning frequency	15,720 Hz horizontal; 60 Hz vertical
Output signals	Composite video signal (VS): 1.0 Vp-p 75 ohms, sync negative Video output signal (V) for EE lens: 0.7 Vp-p, high impedance load
Resolution	Horizontal: 240 lines (at center) Vertical: 190 lines (at center)
Signal-to-noise ratio	46 dB (100 kHz to 4.2 MHz band)
Illumination	Standard: 1000 lux (3200°K), f/8 (60 % subject reflectance) Minimum: 5 lux, f/1.4 (with 6 dB high gain)
Distortion	Less than ± 1 %
Gamma	1
Ambient temperature/humidity	Performance maintenance: 0 to 40° C, RH 50 - 70 % Operation maintenance: -10 to 50° C, RH 90 % or less Storage: -20 to 60° C, RH 70 % or less
Power requirements	DC 9 V ± 2 %, under 1 mVp-p ripple (camera body) AC 117 V ± 10 %, 60 Hz (with AC adaptor)

Power consumption	Approx. 2.7 W (camera body) Approx. 8 W (with AC adaptor)
Sync signal input	Horizontal: 4 Vp-p, negative (15,720 Hz $\pm 1\%$ or less) Vertical: 4 Vp-p, negative (60 Hz $\begin{smallmatrix} +0.5 \\ -1 \end{smallmatrix} \%$ or less)
Power capacity for EE lens	DC 9 V, 30 mA
Lens mount	C mount
Camera mount	1/4 - 20 UNC
Dimensions	Camera body: 25 19 5.2 14 62 (W) x 48 (H) x 131 (L) mm AC adaptor: 74 (W) x 60 (H) x 100 (L) mm (without projections for both specs)
Weight	Camera body: Approx. 0.5 kg (not lens) AC adaptor: Approx. 0.8 kg

Design and specifications are subject to change without notice for improvement.

COMPOSITION

Camera unit	KP-120
AC adaptor	AP-120
EE lens connector	HR10-7P-4P
External sync input connector ..	HR10-7P-6S
Operation manual	
Option	
Power input connector	HR10-7P-4S

3. CONTROLS AND THEIR FUNCTIONS

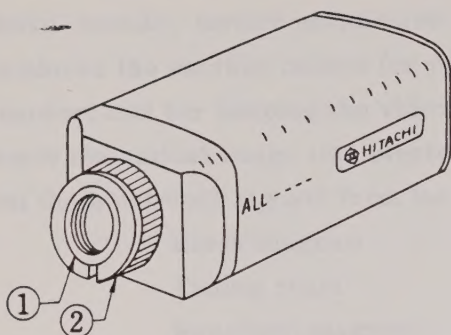


Fig. 1 View of exterior

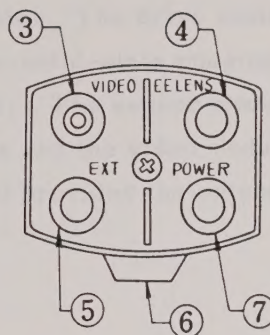


Fig. 2 View of rear panel

- ① Lens mount: Mount the lens here.
- ② Lens mount securing ring: Used to secure the lens mount.
- ③ VIDEO output connector [VIDEO]: Connect a coaxial cable between this connector and the video monitor.
- ④ EE lens connector [EE LENS]: Connect the cable here from the lens when using an EE lens. Bear in mind that the lens power voltage is 9 V (maximum 30 mA) and so select a compatible lens.
- ⑤ External sync input connector [EXT]: Connect the cable from the sync signal generator to this connector when using the camera with external sync.
- ⑥ Camera mount: This mount is for attaching the tripod.
- ⑦ Power input connector [POWER]: Connect the connector of the supplied AC adaptor. This can also be used by connecting an optional power input connector to a regulated power supply. (Refer to Figs. 3 and 4.)

4. CIRCUIT DESCRIPTION

The electrical circuits of this camera are housed on the three modules: drive module, sensor module and video module. The drive module produces the various pulses for operating the solid-state imaging device (sensor) and for shaping the video waveforms. The sensor module converts the optical image into electrical signals and the video module takes out the electrical signals from the sensor and provides the output signal.

Block diagram

Timing chart

Waveform diagram

4.1 Drive circuit board

(1) Horizontal sync pulse generating circuit

The horizontal sync pulse is generated by the astable multivibrator composed of Q4 and Q5. RV3 (H FREQ) is for adjusting the horizontal frequency.

(2) Horizontal clock pulse oscillation circuit

The horizontal clock pulse is provided by the Schmitt trigger circuit which consists of IC2 (⑬ - ⑫), R8, RV2 and C5. The horizontal sync pulse is applied from D2 as the reset pulse. Therefore, the clock pulse is oscillated with the same sync as the horizontal sync pulse.

The horizontal clock pulse (actually Hcp2) is counted by IC7 only during the blanking period and it is sent to the horizontal clock frequency detection control section consisting of IC1 and Q1 through Q3.

When the horizontal clock frequency varies, the pulse width also varies. Therefore, if this pulse is integrated and DC components are detected, the frequency can be controlled. The horizontal clock pulse in the blanking period is DC detected by Q2, RV1, R3 and C2, and it is compared with the reference voltage supplied by Q1, R1/R2 and C1. This difference appears as a +5 V by means of the IC1 differential amplifier and Q3. The +5 V is the power source of the Schmitt trigger and the +5 V is passed on as the change in the oscillation frequency.

The above change works to compensate for the change in the frequency and the horizontal clock frequency is stabilized.

RV1 and 2 are for setting the frequency to 6 MHz and the voltage to + 5 V, respectively.

(3) Sensor drive pulses

The following six pulses are provided by IC3 through 12.

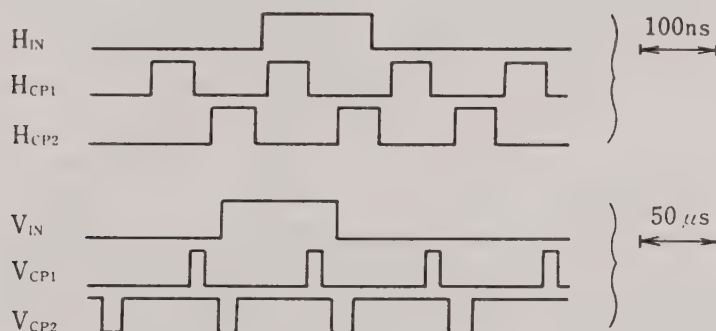


Fig. 3

One Hcp1 pulse must be contained in H_{IN} and one Vcp1 pulse must be contained in V_{IN} . C21 is for H_{IN} and Hcp1 phase adjustment.

(4) Video waveform shaping pulses

The CF (clamp pulse) is fed out from IC6, the BL pulse from IC12 and the sync pulse from IC8.

The horizontal clock pulse is sent to the video circuit board as the input signal of the integral circuit.

(5) External sync circuit

When the HD input signal is supplied from an external source, Q8 turns ON and a voltage is generated at the $\oplus$ side of C13. This means that pin (10) of IC12 is set to a low level, the horizontal sync pulse generating circuit does not operate and the HD signal from the external source is relayed as it is through Q7.

When the VD input signal is supplied from an external source, the reset pulse is sent to IC9 from pin (6) of IC11 via Q9 and pin (9) of IC11.

When there is no such external VD input signal, resetting is automatic with pin (10) of IC11 by the vertical sync signal.

4.2 Sensor circuit board

The sensor is energized by the +7 V voltage supplied from the video circuit board and by the H_{IN} , Hcp1, Hcp2, V_{IN} , Vcp1 and Vcp2 pulses supplied from the drive circuit board.

H_{IN} is the horizontal scanning start pulse while the horizontal shift register is driven by the Hcp1 and Hcp2 pulses and horizontal scanning is performed. In the same way, V_{IN} is the vertical scanning start pulse, the vertical shift register is driven by the Vcp1 and Vcp2 pulses and vertical scanning is performed.

4.3 Video circuit board

(1) Preamplifier

This circuit is composed of Q1 through Q6.

RV1 (BIAS) is for adjusting the video bias (DC bias supplied to the sensor), and due to the relationship with the fixed pattern noise and dynamic range, the higher this bias the better. However, if it is too high, the vertical resolution may deteriorate. The optimum value is between 4 V and 6.5 V, depending on the sensor, and since it fluctuates, it must be adjusted.

To prevent the signal charge from not being fully read, this preamplifier has an input impedance of less than 500 ohms up to 10 MHz, and because of the relationship with the rear-stage integrator circuit, attenuation of more than 12 dB is provided at 6 MHz so as to suppress jumping of the horizontal clock pulse. The output signal at the Q6 emitter has a level of approximately 40 mVp-p.

(2) Integrator circuit

In order to read out the signals from the solid-state imaging device (sensor), the horizontal switches are turned on and off in sequence by the horizontal shift register inside the sensor and the signals from the picture elements are read out one at a time. The horizontal

switches are characterized by a gate stray capacitance and its level depends on the individual switches. Therefore, the spike noise of the Hcp1 pulse that jumps into the signal line has a value which depends on the location, and this becomes the fixed pattern noise.

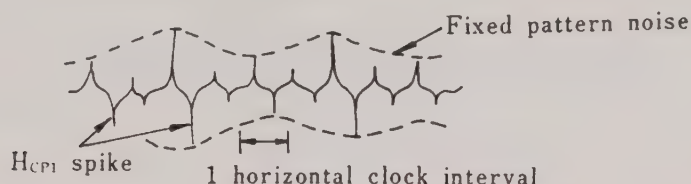


Fig. 4

As seen in the figure, the parts above and below the spikes in the single horizontal clock interval have the same size. This means that the noise components become zero when single horizontal clock interval integration is performed.

Q7 through Q9 compose a circuit which integrates the preamplifier's output signal every horizontal clock interval, repeats the resetting and cancels out the fixed pattern noise.

The optimum width and phase of the integrated reset pulse differs according to the characteristics of the solid-state imaging device and preamplifier, and so they vary with IC1. RV2 and RV3 adjust the width and phase.

The loss of the preamplifier's frequency response is compensated for by emitter peaking with Q7.

(3) Low-pass filter

This is composed of C18 through C21 and L4 through L6, and serves to attenuate the 6 MHz noise (horizontal clock pulse jumping). In order to yield the required resolution, setting is made to 3.3 MHz cutoff and 6 MHz -60 dB.

The emitter resistance of Q11 (RV4) is varied, the gain is adjusted and a trap is provided at the Q12 base to attenuate the 6 MHz noise even further.

(4) Processor circuit

The video signal is clamped by processing IC IC2, and its setup is adjusted by RV5. Then the blanking formed video signal is amplified by Q13 and Q14, and sync is added. The signal is thus fed out from Q15 as the output signal. The level of this output video signal is 0.7 Vp-p under the rated conditions with a 75-ohm load. At this time, DC current is also made to flow to the load.

The IC2 output signal is fed out directly as the EE video signal.

The 7 V power for the sensor is produced by dividing the 9 V voltage by R49 and R50.

5. ADJUSTMENT PROCEDURE

Remove the screws at the center of the rear panel and the rear panel, and pull the cover backward. Then, the inside of the camera is visible. At the top is the video circuit board, at the bottom is the drive circuit board and vertically positioned at the front is the sensor circuit board.

5.1 Drive circuit board

Control	Adjustment	Measurement location	Measuring instrument	Specification
RV2 (+5 V ADJ)	+5 V power supply adjustment	Between IC2, (14) and ground	Digital voltmeter	DC 4.9 ± 0.05 V
RV3 (H FREQ)	Horizontal oscillation frequency adjustment	Between IC2, (8) and ground	Frequency counter	15,720 ± 30 Hz
RV1 (6 M ADJ)	6 MHz clock frequency adjustment	Between IC2, (10) and ground	"	6.036 ± 0.012 MHz

The above three adjustments are interrelated and so they should be repeated.

5.2 Sensor circuit board

No controls provided.

5.3 Video circuit board

Standard conditions

Light source: Tungsten lamp (Color temperature: 3,200°K)

Subject: EIAJ test chart C1

Subject illumination: 1,000 lux

Lens f-number: f/8 with reflection chart

f/11 with transparent chart

Setting must be performed to approximately the above conditions.

Controls	Adjustment	Measurement location	Measuring instrument	Specification
RV5 (SETUP)	Set-up voltage	VIDEO OUT waveform Lens closed	Oscilloscope	$75 \pm 10 \text{ mVp-p}$
RV4 (GAIN)	Gain (high gain at "N" position)	VIDEO OUT waveform	Oscilloscope	$0.7 \pm 0.05 \text{ Vp-p/75 ohms}$
RV2 (WIDTH) RV3 (PHASE)	Fixed pattern noise adjustment Rotate RV2 and RV3 to left and right slowly and set where noise is at a minimum.	VIDEO OUT Lens closed	Monitor screen (Irregular vertical stripes constitute fixed pattern noise)	Minimum value 
CV1 (6 M TRAP)	6 MHz clock noise adjustment Set CV1 to position where noise is at a minimum.	VIDEO OUT Lens closed	Monitor screen (Oscilloscope) (Regular vertical stripes equivalent to 240 TV lines constitute 6 MHz clock noise)	Minimum value 
RV1 (BIAS)	Video bias voltage adjustment When RV1 is rotated cw image will blur at one point. Set to 0.5 V lower voltage.	VIDEO OUT Vertical resolution deteriorates.	Monitor screen Digital voltmeter Start to blue here	Saturation point (point where image becomes blurred) -0.5 V 

6. MAINTENANCE AND INSPECTION

6.1 Inspection

Item	Inspection location	Measuring instrument	Specification
+9 V input	IC1 (7), drive board	digital voltmeter (oscilloscope)	DC 9 V $\pm 2\%$ (Ripple: less than 1 mVp-p)
+5 V	IC2 (14), drive board	Digital voltmeter	DC 5 V ± 0.5 V
+7 V	P1 (3) video board	Digital voltmeter	DC 7 V $\pm 10\%$
6 MHz	IC2 (10) drive board	Frequency counter	6.036 MHz $\pm 1\%$
Horizontal frequency	IC2 (8), drive board	"	15,720 Hz $\pm 1\%$
Vertical frequency	IC12 (11), drive board	"	60 Hz $\pm 1\%$
Video output	VIDEO connector	Oscilloscope	(V) 0.7 ± 0.1 Vp-p (S) 0.3 ± 0.04 Vp-p Setup: 75 ± 35 mVp-p
EE output	EE lens connector (1) (3)	Digital voltmeter, oscilloscope	+9 V (V) 0.7 ± 0.2 Vp-p
Sensor drive pulses	$H_{IN}/H_{cp1}/H_{cp2}$ $V_{IN}/V_{cp1}/V_{cp2}$	Refer to timing chart and waveform diagram	

6.2 Disassembly and re-assembly

Refer to the exploded view.

(1) Removal of the cover

- a. Remove the center screws on the rear panel.
- b. Remove the rear panel.
- c. Pull out the cover to the rear.

(2) Removal of the video circuit board

- a. Remove connectors J11-J15.
- b. Remove the screws at the four corners.
- c. Hold up the lens side of the board and remove it. The board is fastened together to the shielding plate and so the plate is removed too.

(3) Removal of the drive circuit board

- a. Remove connectors J20-J24.
- b. Remove the screws at the four corners.
- c. Hold up the rear panel side (opposite side to that of video circuit board) of the drive board and remove it.

(4) Removal of the sensor circuit board

The sensor board is fastened together to the chassis.

- a. Remove the two screws which secure the board.

(5) Re-assembly

- a. Re-assemble the cover and boards, following the procedure for disassembly in reverse.
- b. Mount the video circuit board at the top and the drive circuit board at the bottom.
- c. Insert the connectors securely.
 - There are two sets of wires that connect the video and drive circuit boards.
 - As two 3-pin connectors are connected to the video and drive circuit boards, check the color marking of the connector before connection.

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6.3 Maintenance and repair precautions

- (1) Handle the sensor with extreme caution.
- (2) Replace the parts after having removed the circuit board.
- (3) In order to improve the electrical performance, L4 through 6 on the video circuit board must be mounted so that their polarities are aligned properly. As in the figure on the right, mount the longer lead at the CV1 side.

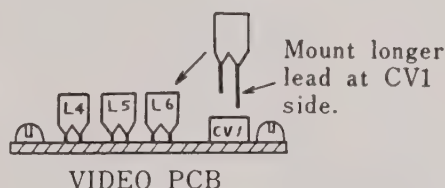


Fig. 5

* High gain selection

When the camera is shipped from factory, the gain is set to normal. High gain may be set, however, if so required.

Selection method

When the gain selection pin on the video circuit board is changed over from "N" to "H," the output signal (video component only) is nearly doubled.

* Usable lenses (caution with blooming)

If an excessively strong light is made incident to the sensor, the charge increases substantially and white vertical stripes appear on the screen (this phenomenon is known as blooming).

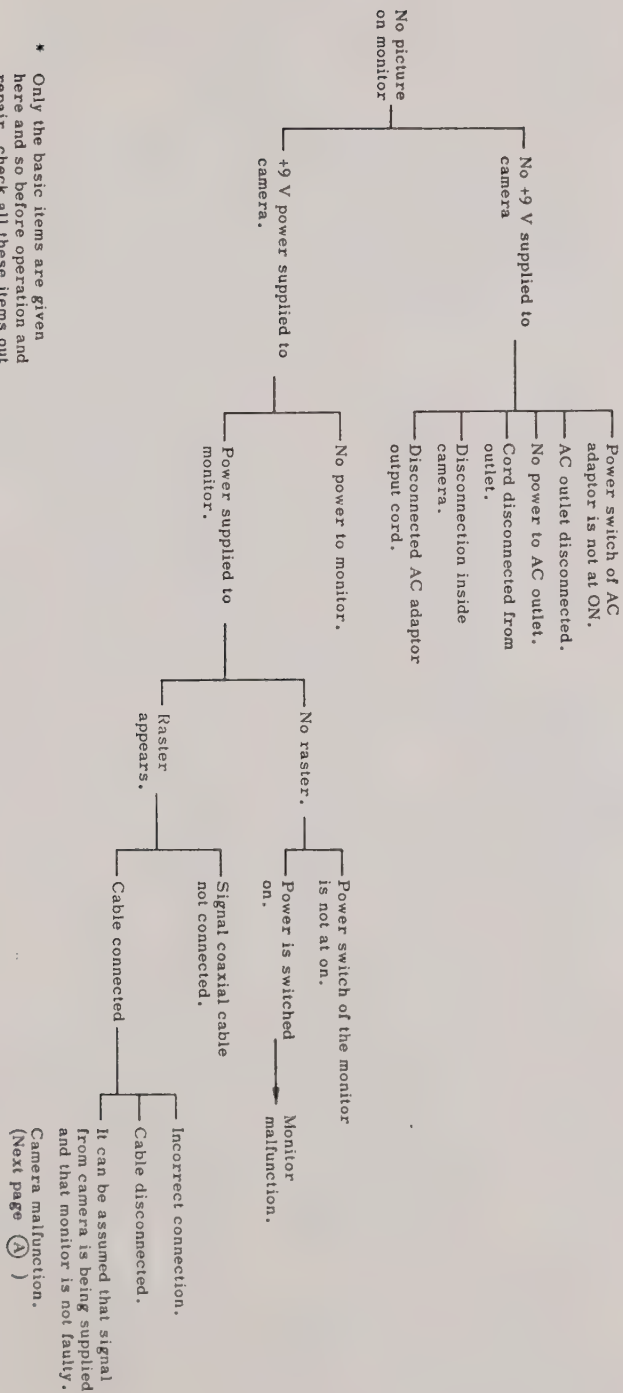
Since the KP-120 is a highly sensitive camera, stopping down an ordinary lens (f2 to f22) may not be possible when used outdoors during the day, and blooming may occur. In cases like this, a lens with a high f-number should be used.

[Reference] For COSMICAR auto iris "ES" lens series

C815ES	8.5 mm	Equivalent to f/1.5 - f/360
C1616AES	16 mm	Equivalent to f/1.6 - f/360
C6Z1218MES	12.7 to 75 mm	Equivalent to f/1.8 - f/360
C10Z1120MES	11 to 110 mm	Equivalent to f/2.0 - f/360

7. TROUBLESHOOTING

Chart 1



* Only the basic items are given here and so before operation and repair, check all these items out properly.

Chart II

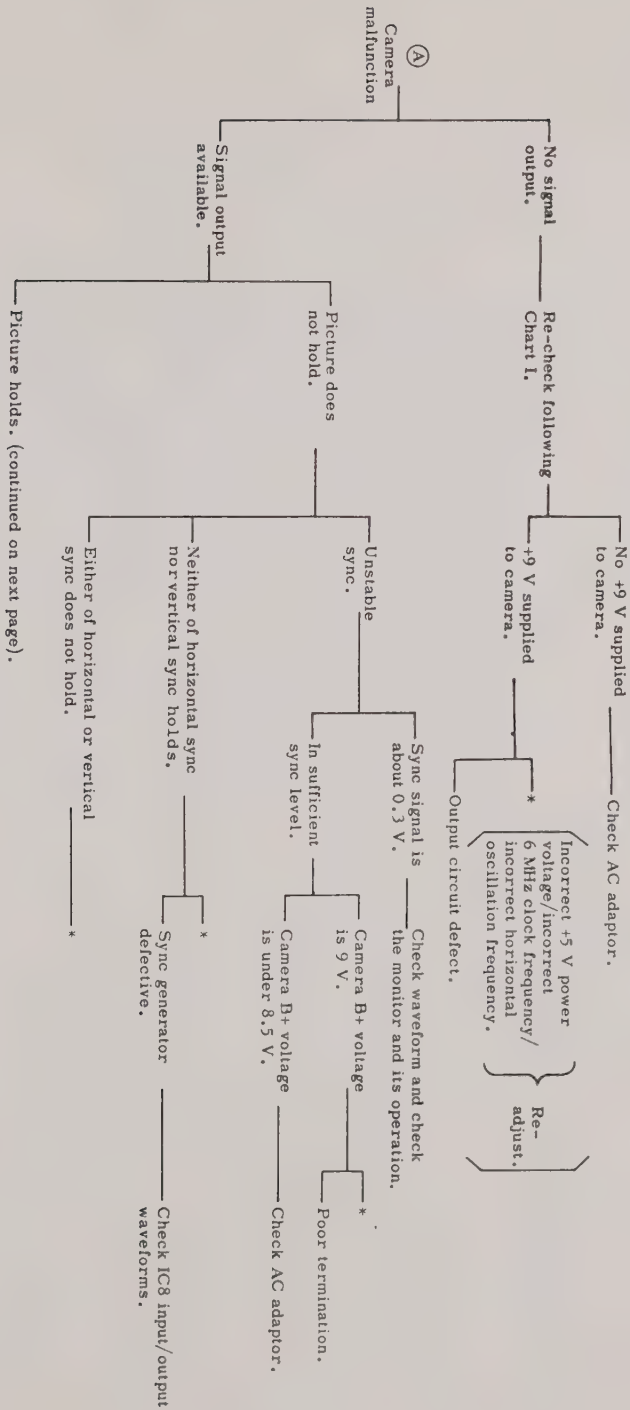
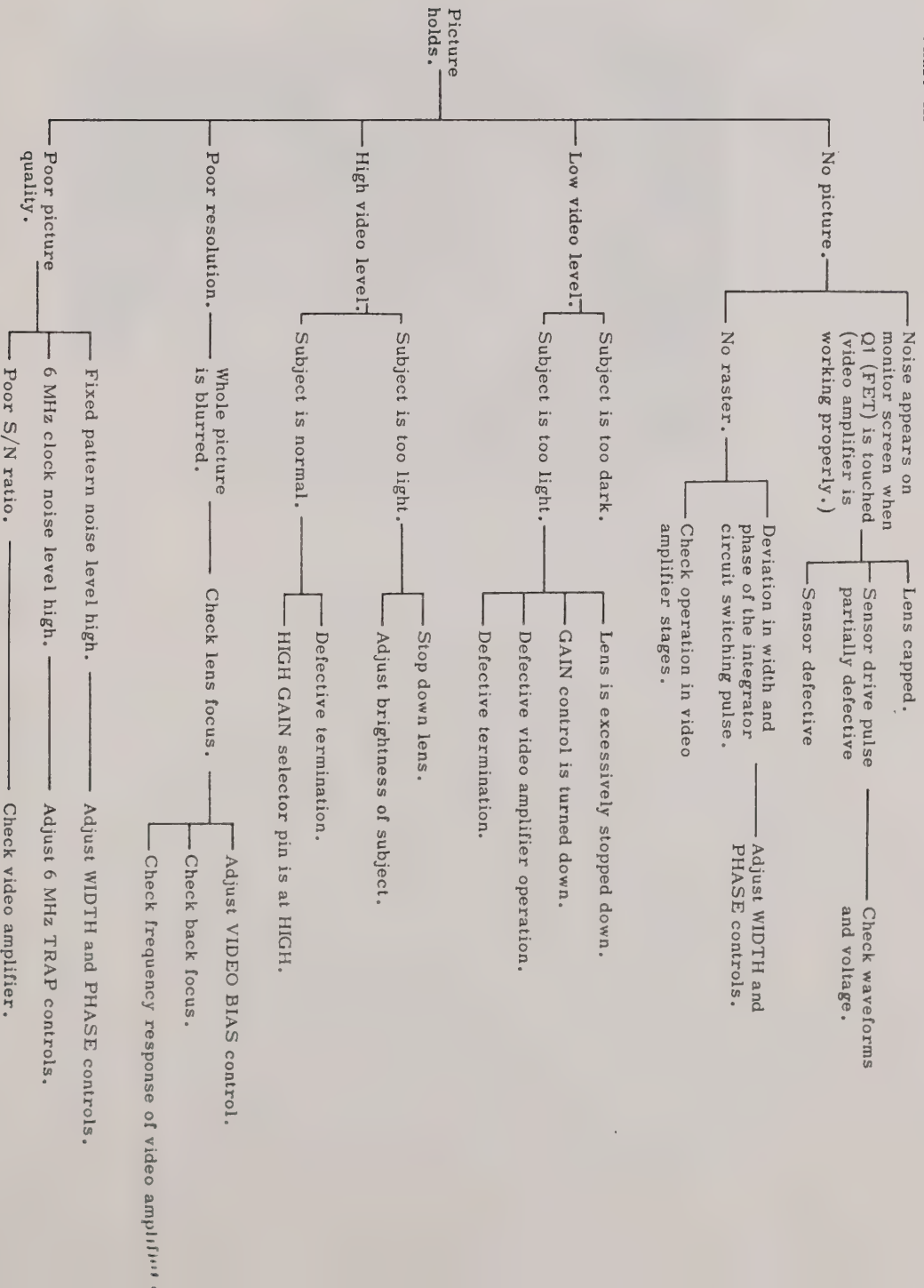
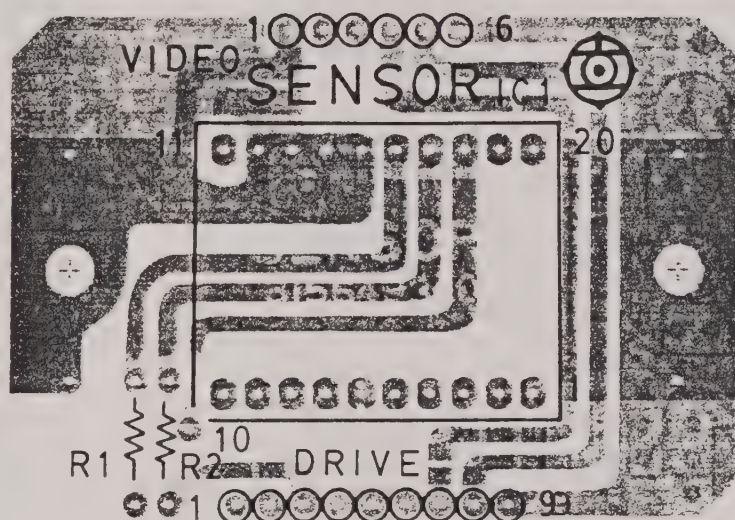


Chart III

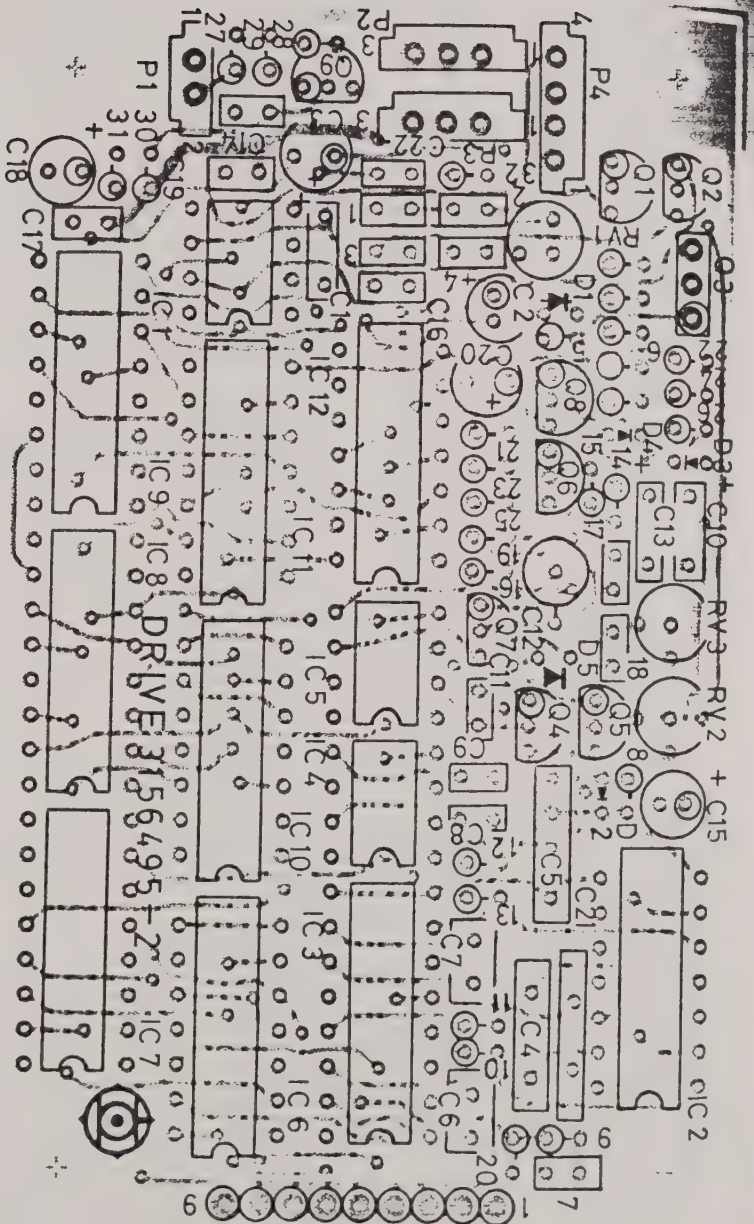


8. ELECTRICAL PARTS ARRANGEMENT

SENSOR PCB



2. The Q "O" sign denotes base; the C "O" sign denotes the (+) position.
3. The longer lead is connected at the L "O" side (see figure on right).
(This is to align the polarities of L4 and L5.)



DRIVE PCB

Notes:

1. The "R" denoting resistance has been omitted and indication is with the number only (there are five R6's).
2. The "O" sign for a transistor denotes the base and the "O" sign for a capacitor denotes the (+) position.
3. The boxed resistors are metal resistors.

stock #

HR10-7P-4S

9. ELECTRICAL PARTS LIST CHASSIS

Part Code	Symbol	Description	Remarks
<u>Connectors</u>			
JMH0069	CN 1	HR10-7R-6P	7-2-4-5 7P
JMH0068	2	HR10-7R-1P	
JMH0067	3	HR10-7R-4S	
JHU0015	4	UG-625 C-4	
JBT0022	J 12	TL-25H-1P	TL-0144
"	13	"	
JBT0015	14	TL-25H-4P	
JBT0014	15	TL-25H-2P	
JBT0014	21	TL-25H-2P	TL-0144
JBT0022	22	TL-25H-3P	
"	23	"	
JBT0015	24	TL-25H-4P	
8334613	XJ 10	Contact	TL-0144
"	20	"	

SENSOR PCB

Part Code	Symbol	Description	Remarks
<u>IC</u>			
I2H0016	IC 1	HEV7211	
<u>Resistors</u>			
RCR3021	R 1	Carbon 1/4W 512 $\pm 5\%$	
"	2	"	
<u>Connectors</u>			
ETP0051	J 1	Socket 75540	
JBT0008	P 1	Connector TL-25P-9V	
JBT0017	J 11	" TL-25H-6P	
8334613	XJ 11	Contact TL-0144	

VIDEO PCB

Part Code	Symbol	Description	Remarks
<u>IC's</u>			
IDH0041	IC 1	HD74LS123	
ILH0092	2	HA11719	
<u>Transistors</u>			
HTK0049	Q 1	2SK41-3	
HTC0168	2	2SC535C	
"	3	"	
HTA0105	4	2SA836D	
HTC0148	5	2SC458C	
HTA0105	6	2SA836D	
HTC0148	7	2SC458C	
HTK0065	8	1SK60	
HTC0148	9	2SC458C	
"	10	"	
"	11	"	
"	12	"	
HTC0148	13	2SC458C	
HTA0105	14	2SA836D	
HTC0056	15	2SC1213AC	

Part Code	Symbol	Description	Remarks
<u>Resistors</u>			
HIC0056	R 1	Carbon 1/8W 3300 $\pm 5\%$	
RCR1106		"	
"		"	
"		"	
RCR1350	2	" 1/4W 1M $\pm 5\%$	
RCR1317	3	" 120K $\pm 5\%$	
RCR1397	4	" 560 $\pm 5\%$	
RCR1395	5	" 180 $\pm 5\%$	
RCR1404	6	" 220 $\pm 5\%$	
RCR1402	7	" 220 $\pm 5\%$	
RCR1402	8	" 1500 $\pm 5\%$	
RCR1390	9	" 100 $\pm 5\%$	
RCR1404	10	" 2200 $\pm 5\%$	
RCR1397	11	" 560 $\pm 5\%$	
RCR1393	12	" 270 $\pm 5\%$	
RCR1402	13	" 1500 $\pm 5\%$	
RCR1396	14	" 470 $\pm 5\%$	
RCR1394	15	" 330 $\pm 5\%$	
RCR1408	16	" 5600 $\pm 5\%$	
RCR1417	17	" 39K $\pm 5\%$	
RCR1413	18	" 22 $\pm 5\%$	
RCR1657	19	" 180 $\pm 5\%$	
RCR1673	20	" 3600 $\pm 5\%$	
RCR1409	21	" 6800 $\pm 5\%$	
RCR1657	22	" 180 $\pm 5\%$	
RCR1402	23	" 1500 $\pm 5\%$	
RCR1400	24	" 1000 $\pm 5\%$	
RCR1407	25	" 4700 $\pm 5\%$	
RCR1406	26	" 3300 $\pm 5\%$	
RCR1405	27	" 2700 $\pm 5\%$	
RCR1409	28	" 6800 $\pm 5\%$	
RCR1406	29	" 3300 $\pm 5\%$	
RCR1402	30	" 1500 $\pm 5\%$	
RCR1404	31	" 2200 $\pm 5\%$	
RCR1403	32	" 1800 $\pm 5\%$	
RCR1404	33	" 2200 $\pm 5\%$	
"	34	"	
RCR1401	35	" 1200 $\pm 5\%$	
RCR1404	36	" 2200 $\pm 5\%$	
RCR1411	37	" 10K $\pm 5\%$	
RCR1402	38	" 1500 $\pm 5\%$	
RCR1401	39	" 1200 $\pm 5\%$	
RCR1674	40	" 3900 $\pm 5\%$	
RCR1401	41	" 2200 $\pm 5\%$	
RCR1406	42	" 3300 $\pm 5\%$	
RCR1403	43	" 1800 $\pm 5\%$	
RCR1404	44	" 2200 $\pm 5\%$	
RCR1687	45	" 27K $\pm 5\%$	
RCR1400	46	" 1000 $\pm 5\%$	
RCR1250	47	" 1/4W 68 $\pm 5\%$	
RCR1400	48	" 1/8W 1000 $\pm 5\%$	
RCR1401	49	" 1200 $\pm 5\%$	
RCR1407	50	" 4700 $\pm 5\%$	
RCR1254	51	" 1/4W 100 $\pm 5\%$	
"	52	"	
RCR1406	53	" 1/8W 3300 $\pm 5\%$	
RCR1673	54	" 3600 $\pm 5\%$	
<u>Capacitors</u>			
CST0465	C 1	Tantal 16V 33 $\pm 20\%$	
CCR0138	2	Ceramic 50V 0.098 $\pm 10\%$	
CMD0004	3	Mica 100V 2 pF $\pm 0.5\%$	
CST0465	4	Tantal 16V 33 $\pm 20\%$	
CMD0476	5	Mica 100V 82 pF $\pm 5\%$	
CST0465	6	Tantal 16V 33 $\pm 20\%$	
"	7	"	
CSC0173	8	" 10 $\pm 5\%$	
CMD0045	9	Mica 100V 100 pF $\pm 5\%$	
CSC0173	10	Tantal 16V 10 $\pm 20\%$	
CMD0474	11	Mica 100V 62 pF $\pm 5\%$	
CSC0173	12	Tantal 16V 10 $\pm 20\%$	
CST0465	13	" 33 $\pm 5\%$	
CCR0123	14	Ceramic 50V 0.01 $\pm 10\%$	
CMD0013	15	Mica 100V 15 pF $\pm 5\%$	
CMD0017	16	" 22 pF $\pm 5\%$	
CSC0173	17	Tantal 16V 10 $\pm 20\%$	
CMD0025	18	Mica 100V 47 pF $\pm 5\%$	
CMD0476	19	" 82 pF $\pm 5\%$	
"	20	"	
CMD0025	21	" 47 pF $\pm 5\%$	
CST0465	22	Tantal 16V 33 $\pm 20\%$	
CCR0137	23	Ceramic 50V 0.047 $\pm 10\%$	
CST0465	24	Tantal 16V 33 $\pm 20\%$	
CCR0106	25	Ceramic 50V 0.022 $\pm 10\%$	
CST0465	26	Tantal 16V 33 $\pm 20\%$	
"	27	"	
CES00168	28	Elyc 10V 100 $\pm 5\%$	
CES0028	29	" 47 $\pm 5\%$	
CCR0128	30	Ceramic 50V 0.1 $\pm 10\%$	
CES0028	31	Elyc 10V 47 $\pm 5\%$	
CCR0128	32	Ceramic 50V 0.1 $\pm 10\%$	

Part Code	Symbol	Description	Remarks
CES0028	C 33	Elyc 10V 47 μ F	
CCR0128	34	Ceramic 50V 0.1 μ F +80% -20%	
CES0028	35	Elyc 10V 47 μ F	
CCR0128	36	Ceramic 50V 0.1 μ F +80% -20%	
CSX0138	37	Tantal " 1 μ F -20%	
CES0028	38	Elyc 10V 47 μ F	
CCC1009	39	Ceramic 50V 27 pF +5%	
<u>Var. Resistors</u>			
RNX0031	RV 1	Metal 10k Ω	
"	2	" "	
"	3	" "	
RNX0030	4	" 1k Ω	
RNX0034	5	" 2k Ω	
<u>Var. Capacitor</u>			
83379292	CV 1	TZ0T110E	
<u>Coils</u>			
TLF0067	L 1	100 μ H	
"	2	" "	
"	3	" "	
TLF0018	4	68 μ H	
TLF0066	5	82 μ H	
TLF0038	6	68 μ H	
"	7	" "	
<u>Connectors</u>			
ETP0088	J 1	Receptacle 60983-1	
JBT0005	P 1	TL-25P-6V	
JBT0002	2	TL-25P-3V	
"	3	" "	
JBT0003	4	TL-25P-4V	
JBT0001	5	TL-25P-2V	
ETP0082	6	Pin 60809-1	
"	7	" "	

DRIVE PCB

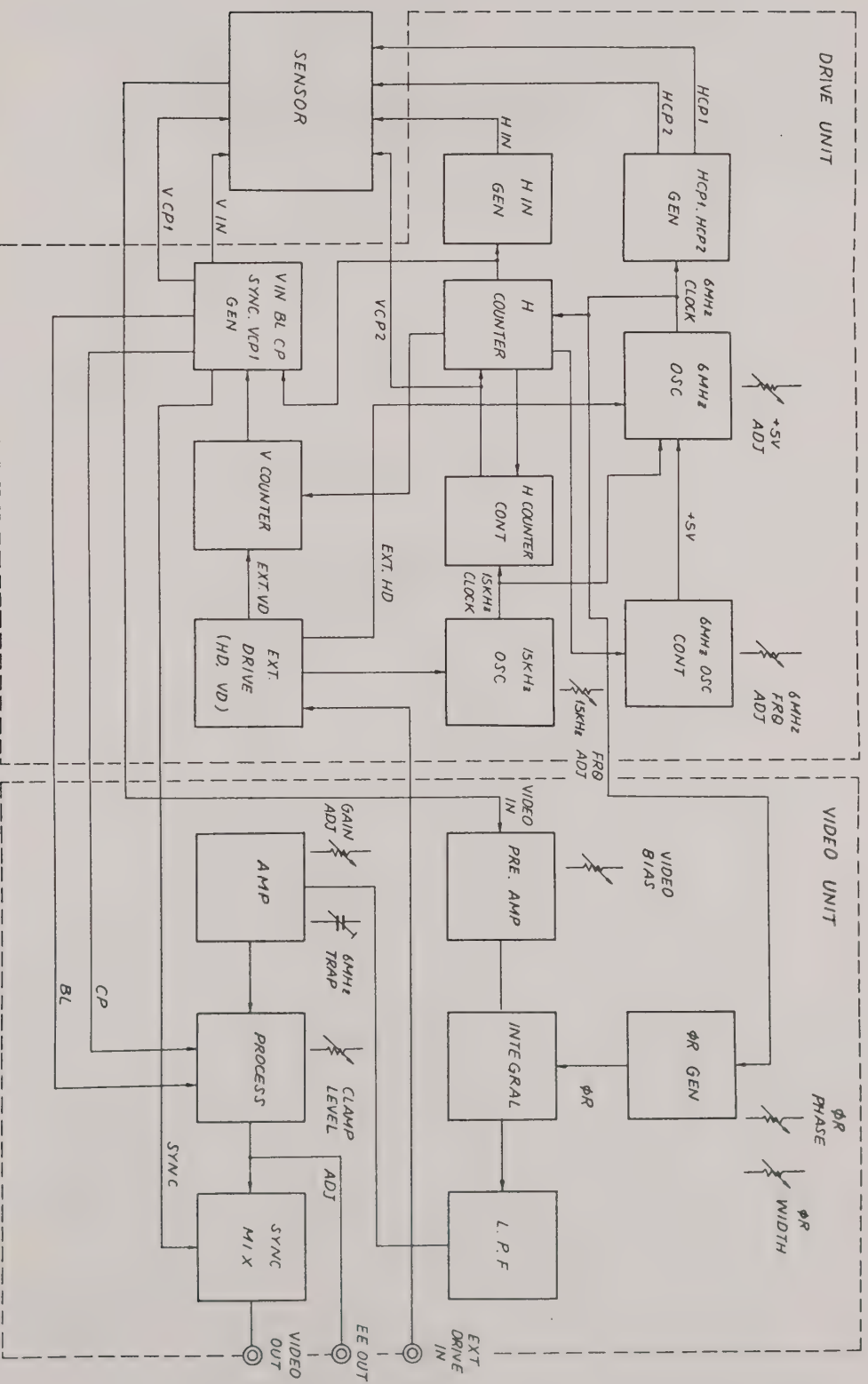
Part Code	Symbol	Description	Remarks
<u>IC's</u>			
ILH0088	IC 1	HA17741 PS	
IDH0008	2	HD74LS14P	
IDH0043	3	HD74LS123	
IDM0081	4	MMH0026C	
"	5	" "	
IDH0589	6	HD14013B	
IDC0129	7	CD4040BE	
IDH0591	8	HD14027B	
IDC0129	9	CD4040BE	
IDH0549	10	HD14013B	
IDH0590	11	HD14023B	
IDH0587	12	HD14001B	
<u>Transistors</u>			
HTA0105	Q 1	2SA836D	
"	2	" "	
HTA0164	3	2SA715C	
HTC0148	4	2SC458C	
"	5	" "	
HTA0105	6	2SA836D	
HTC0148	7	2SC458C	
HTA0105	8	2SA836D	
HTC0148	9	2SC458C	
<u>Diodes</u>			
HDIH0031	D 1	HZ6B	
HDS0110	2	1S2076A	
HDIH0031	3	HZ6B	
HDS0110	4	1S2076A	
"	5	" "	

Part Code	Symbol	Description	Remarks
<u>Resistors</u>			
RMR3392	R 1	Metal 1/8W 680 Ω +1%	
RMR3390	2	" " 560 Ω -1%	
RMR3406	3	" " 6800 Ω "	
RMR3390	4	" " 560 Ω "	
RCR4396	5	Carbon " 470 Ω +5%	
RCR3260	6	" 1/4W 180 Ω -1%	
RMR3380	7	Metal 1/8W 220 Ω +1%	
RCR4390	8	Carbon " 100 Ω -5%	
RCR4400	9	" " 1000 Ω "	
RCR4408	10	" " 5600 Ω "	
KCR4404	11	" " 2200 Ω "	
RCR4400	12	" " 1000 Ω "	
"	13	" " " "	
RCR4394	14	" " 330 Ω "	
RCR4404	15	" " 2200 Ω "	
RCR4400	16	" " 1000 Ω "	
RMR3422	17	Metal " 33k Ω +1%	
RMR3418	18	" " 22k Ω -1%	
RCR4404	19	Carbon " 2200 Ω +5%	
RCR4400	20	" " 1000 Ω -1%	
RCR3252	21	" 1/4W 82 Ω "	
RCR3282	22	" " 1500 Ω "	
RCR4411	23	" 1/8W 10k Ω "	
RCR4400	24	" " 1000 Ω "	
RCR4411	25	" " 10k Ω "	
RCR4422	26	" " 220k Ω "	
RCR4410	27	" " 8200 Ω "	
RCR4399	28	" " 820 Ω "	
RCR4400	29	" " 1000 Ω "	
"	30	" " " "	
RCR4407	31	" " 4700 Ω "	
RCR3251	32	" 1/4W 75 Ω "	
<u>Var. Resistors</u>			
RNX0036	RV 1	Metal 5k Ω	
RNX0032	2	" 100 Ω	
RNX0036	3	" 5k Ω	
<u>Capacitors</u>			
CSX0138	C 1	Tantal 50V 1 μ F +20%	
CES0028	2	Elyc 10V 47 μ F	
CSC0173	3	Tantal 16V 10 μ F +20%	
CMD0947	4	Mica 300V 470 pF +5%	
"	5	" " " "	
CMD0022	6	" 100V 33 pF "	
CMD0519	7	" 5 pF -0.5%	
CCR0136	8	Ceramic 50V 0.001 μ F +80% -20%	
"	9	" " " "	
CSX0138	10	Tantal " 1 μ F +20%	
COA0007	11	Plastic " 0.0047 μ F +10%	
COC0249	12	" 150V 470 pF +5%	
CSX0138	13	Tantal 50V 1 μ F +20%	
CCR0121	14	Ceramic " 0.0047 μ F +80% -20%	
CES0028	15	Elyc 10V 47 μ F	
CCR0128	16	Ceramic 50V 0.1 μ F +80% -20%	
"	17	" " " "	
CEC0028	18	Elyc 10V 47 μ F	
CCR0128	19	Ceramic 50V 0.1 μ F +80% -20%	
CSC0173	20	Tantal 16V 10 μ F +20%	
CCC1160	21	Ceramic 50V 330 pF +10% -80%	
CCR0128	22	" " 0.1 μ F -20%	
<u>Connectors</u>			
JBT0001	P 1	TL-25P-2V	
JBT0002	2	TL-25P-3V	
"	3	" "	
JBT0003	4	TL-25P-4V	
JBT0020	J 20	TL-25H-9P	
8334613	XJ 20	Contact TL-0114	

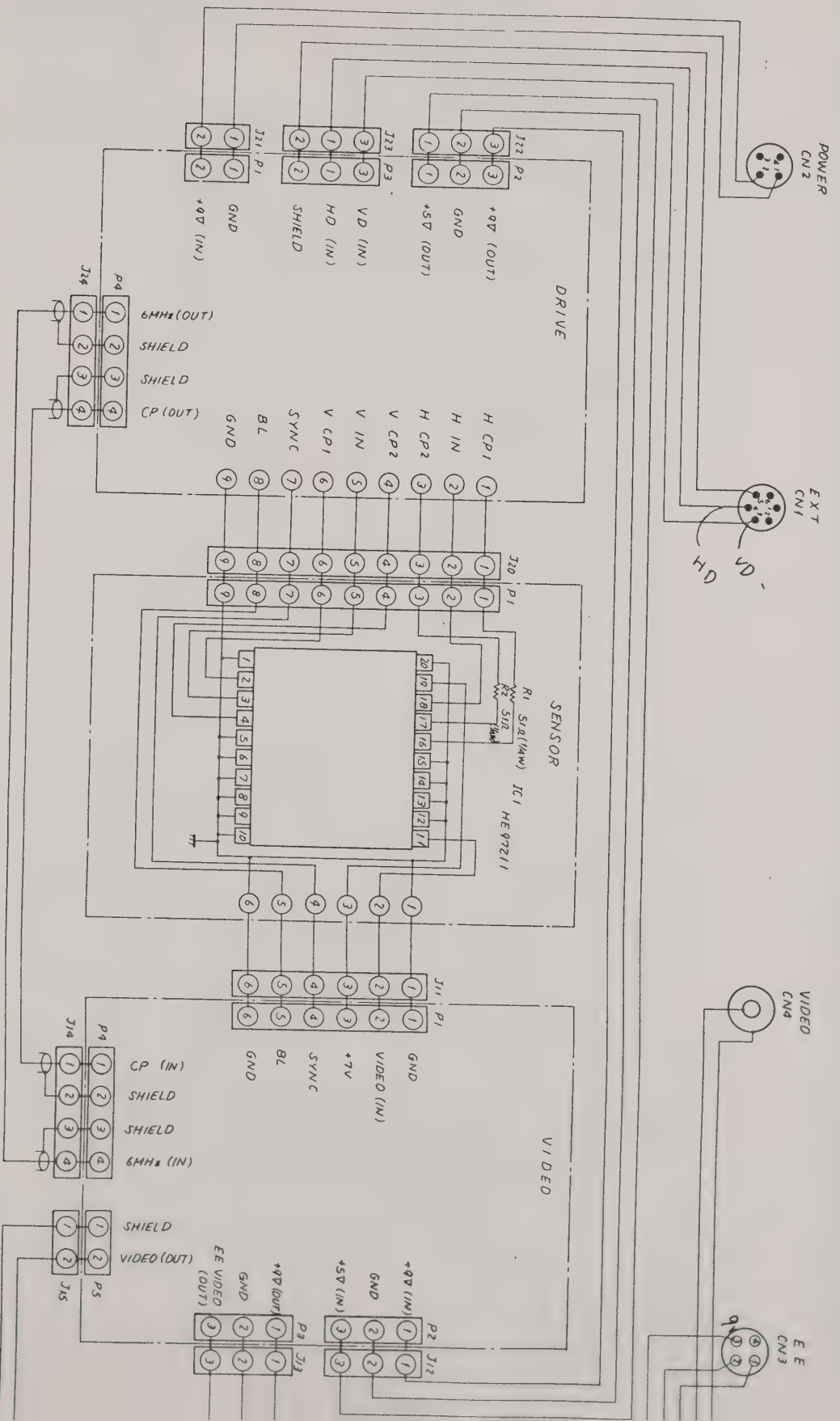
ACCESSORIES

Part Code	Symbol	Description	Remarks
JMH0066		<u>Connectors</u>	
JMH0065		HR10-71'-05	
		HR10-71'-11' 1013.	

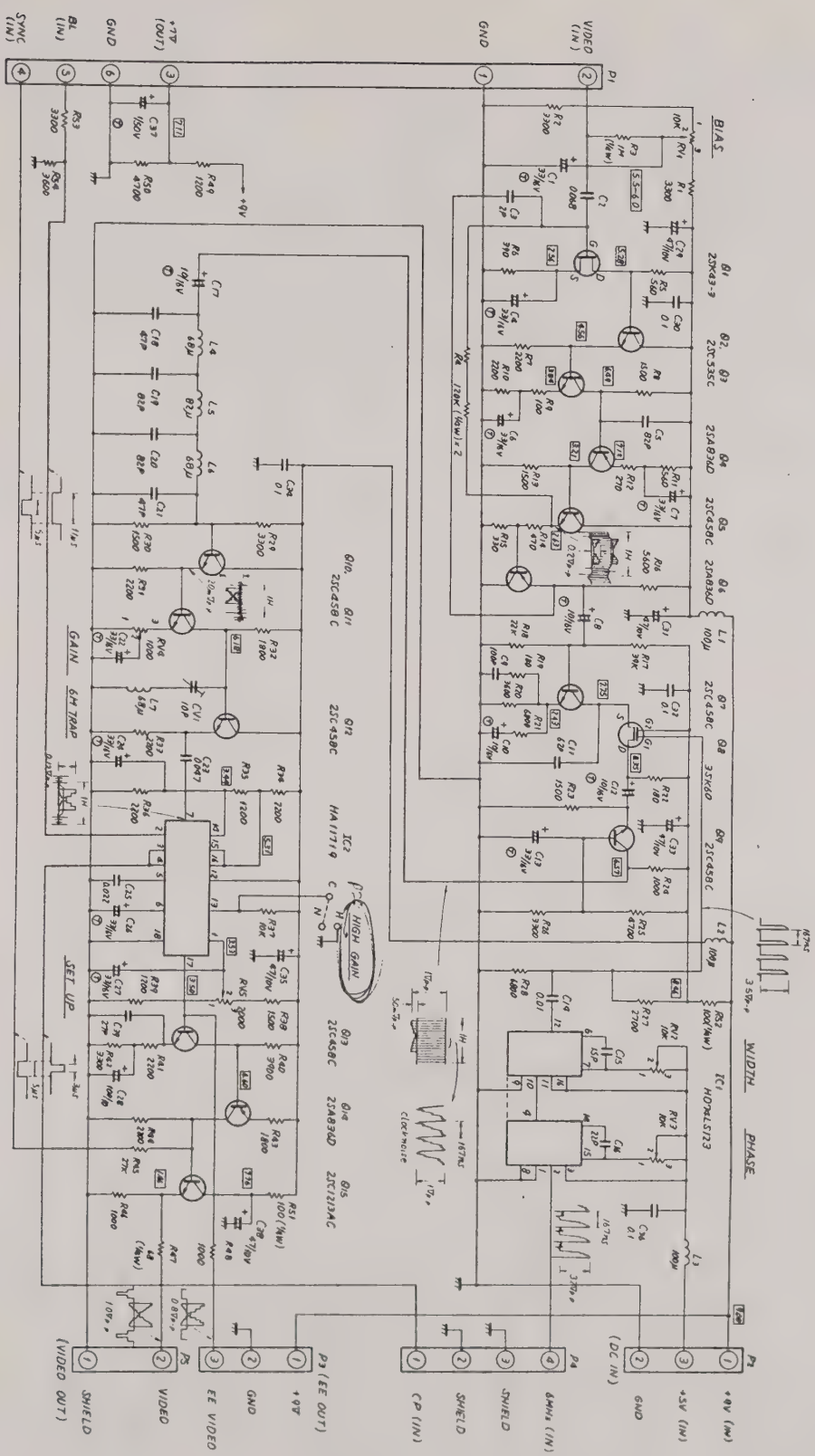
10. SCHEMATIC DIAGRAMS



BLOCK DIAGRAM



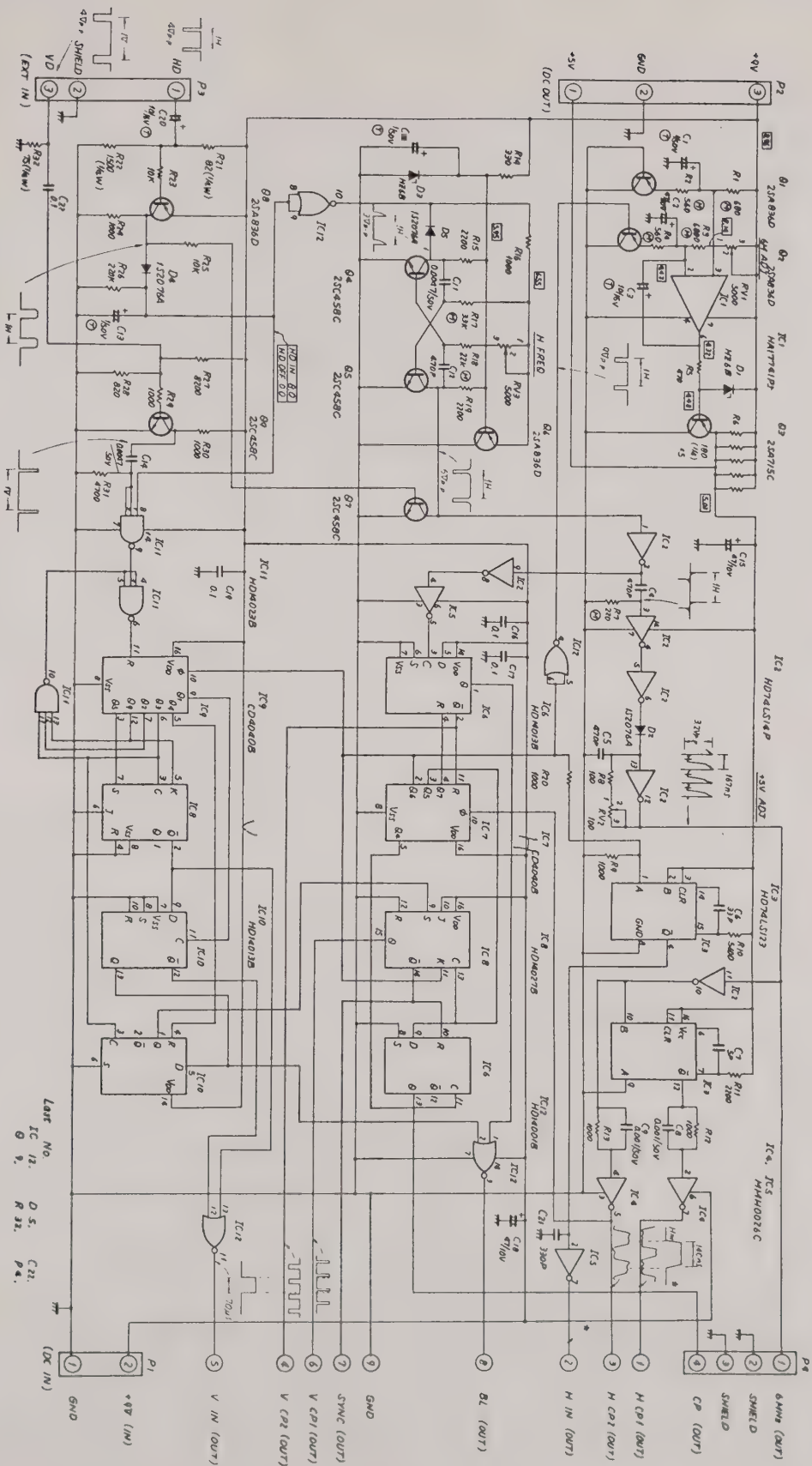
CHASSIS
SCHEMATIC DIAGRAM



VIDEO PCB
SCHEMATIC DIAGRAM

- NOTES
- 1 ALL RESISTANCE VALUES ARE IN OHMS
 - 2 ALL RESISTANCE ARE 1/8 W UNLESS OTHERWISE SPECIFIED
 - 3 ALL CAPACITANCE VALUES ARE IN P.F. UNLESS OTHERWISE SPECIFIED
 - 4 CAPACITORS ARE IN P.F. UNLESS OTHERWISE SPECIFIED
 - 5 1/2 D.C. VOLTAGE
- IC NO. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

LENS
RED.
BLACK
WHITE

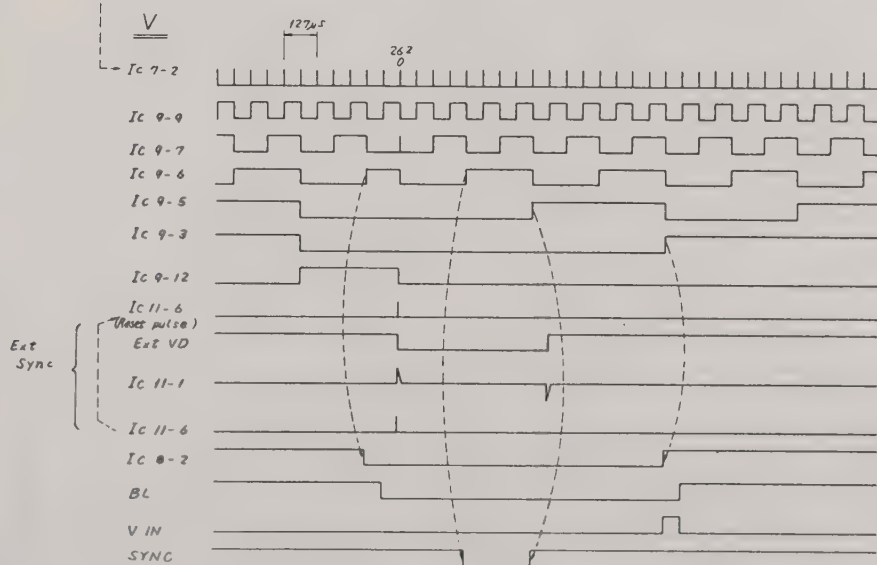
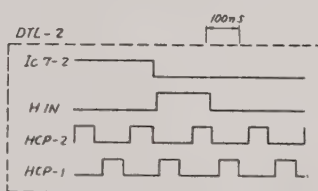
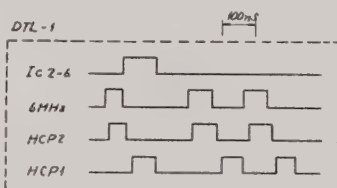
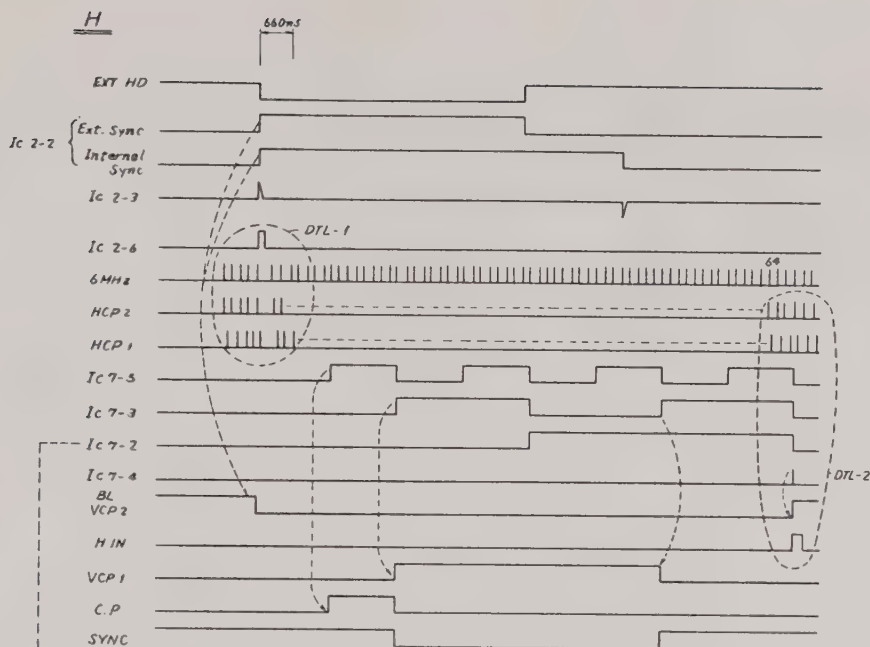


DRIVE PCB
SCHEMATIC DIAGRAM

- NOTES
1. ALL RESISTANCE
 2. ARE IN OHMS
 3. ALL RESISTANCE A
 4. W/ 1% TOLERANCE
 5. UNLESS OTHERWISE
 6. SPECIFIED
 7. CAPACITANCE A/F
 8. UNLESS OTHERWISE
 9. SPECIFIED
 10. CAPACITANCE A/F
 11. UNLESS OTHERWISE
 12. SPECIFIED
 13. CAPACITANCE A/F
 14. UNLESS OTHERWISE
 15. SPECIFIED
 16. CAPACITANCE A/F
 17. UNLESS OTHERWISE
 18. SPECIFIED
 19. CAPACITANCE A/F
 20. UNLESS OTHERWISE
 21. SPECIFIED
 22. CAPACITANCE A/F
 23. UNLESS OTHERWISE
 24. SPECIFIED
 25. CAPACITANCE A/F
 26. UNLESS OTHERWISE
 27. SPECIFIED
 28. CAPACITANCE A/F
 29. UNLESS OTHERWISE
 30. SPECIFIED
 31. CAPACITANCE A/F
 32. UNLESS OTHERWISE
 33. SPECIFIED
 34. CAPACITANCE A/F
 35. UNLESS OTHERWISE
 36. SPECIFIED
 37. CAPACITANCE A/F
 38. UNLESS OTHERWISE
 39. SPECIFIED
 40. CAPACITANCE A/F
 41. UNLESS OTHERWISE
 42. SPECIFIED
 43. CAPACITANCE A/F
 44. UNLESS OTHERWISE
 45. SPECIFIED
 46. CAPACITANCE A/F
 47. UNLESS OTHERWISE
 48. SPECIFIED
 49. CAPACITANCE A/F
 50. UNLESS OTHERWISE
 51. SPECIFIED
 52. CAPACITANCE A/F
 53. UNLESS OTHERWISE
 54. SPECIFIED
 55. CAPACITANCE A/F
 56. UNLESS OTHERWISE
 57. SPECIFIED
 58. CAPACITANCE A/F
 59. UNLESS OTHERWISE
 60. SPECIFIED
 61. CAPACITANCE A/F
 62. UNLESS OTHERWISE
 63. SPECIFIED
 64. CAPACITANCE A/F
 65. UNLESS OTHERWISE
 66. SPECIFIED
 67. CAPACITANCE A/F
 68. UNLESS OTHERWISE
 69. SPECIFIED
 70. CAPACITANCE A/F
 71. UNLESS OTHERWISE
 72. SPECIFIED
 73. CAPACITANCE A/F
 74. UNLESS OTHERWISE
 75. SPECIFIED
 76. CAPACITANCE A/F
 77. UNLESS OTHERWISE
 78. SPECIFIED
 79. CAPACITANCE A/F
 80. UNLESS OTHERWISE
 81. SPECIFIED
 82. CAPACITANCE A/F
 83. UNLESS OTHERWISE
 84. SPECIFIED
 85. CAPACITANCE A/F
 86. UNLESS OTHERWISE
 87. SPECIFIED
 88. CAPACITANCE A/F
 89. UNLESS OTHERWISE
 90. SPECIFIED
 91. CAPACITANCE A/F
 92. UNLESS OTHERWISE
 93. SPECIFIED
 94. CAPACITANCE A/F
 95. UNLESS OTHERWISE
 96. SPECIFIED
 97. CAPACITANCE A/F
 98. UNLESS OTHERWISE
 99. SPECIFIED
 100. CAPACITANCE A/F

6.2.5

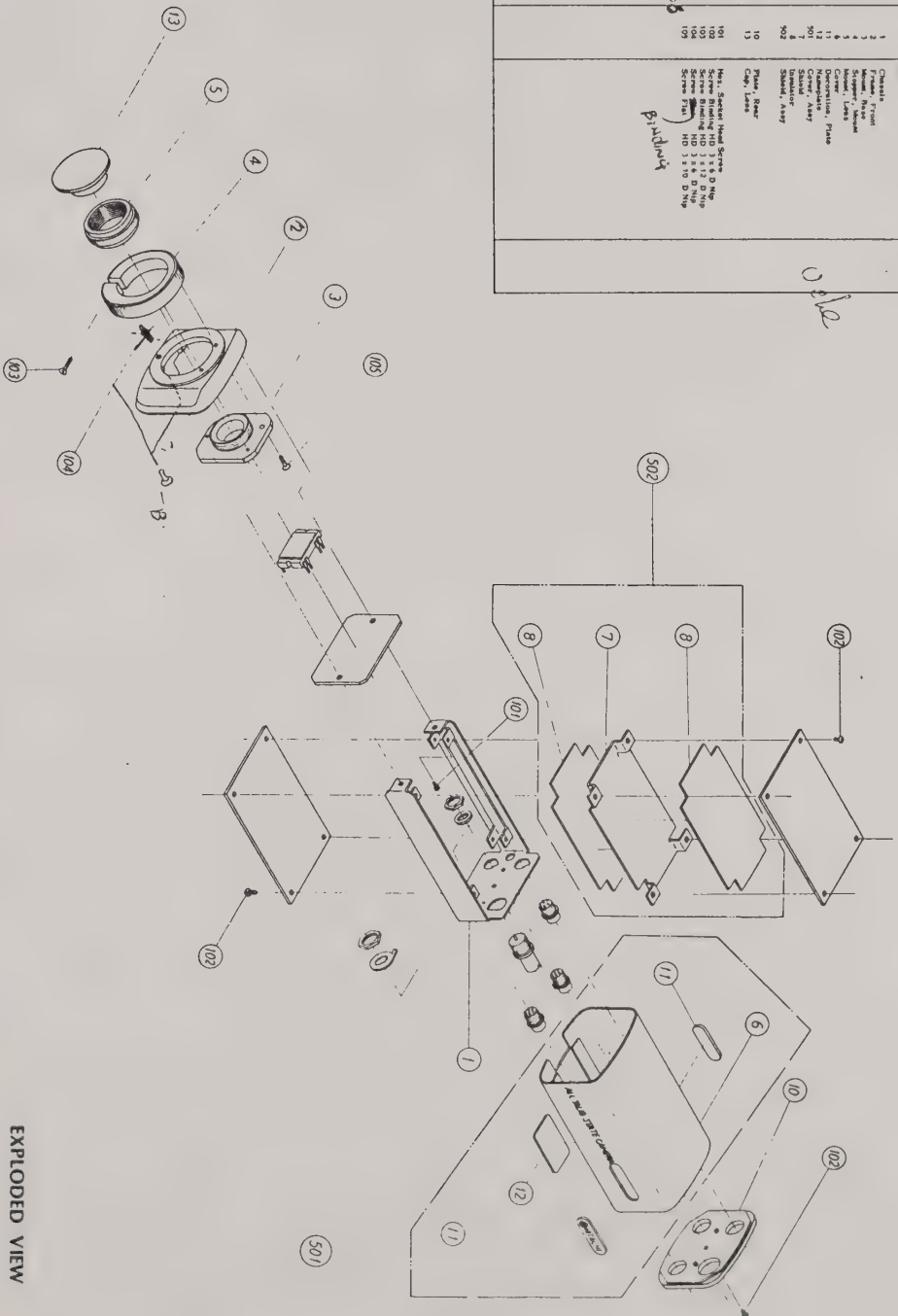
11. TIMING CHARTS



HY-78 4F

12. MECHANICAL PARTS LIST AND EXPLODED VIEW

Part Code	Symbol	Description	Quantity
31340023A	1	Chassis	1
31340023A	2	Frame, Front	1
31340023A	3	Support, Mount	1
31340023A	4	Cover, Lens	1
31340023A	5	Cover, Lens	1
31340023A	6	Cover, Lens	1
31340023A	7	Cover, Lens	1
31340023A	8	Cover, Lens	1
31340023A	9	Cover, Lens	1
31340023A	10	Cover, Lens	1
31340023A	11	Cover, Lens	1
31340023A	12	Cover, Lens	1
31340023A	13	Cover, Lens	1
31340023A	14	Cover, Lens	1
31340023A	15	Cover, Lens	1
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31340023A	17	Cover, Lens	1
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31340023A	19	Cover, Lens	1
31340023A	20	Cover, Lens	1
31340023A	21	Cover, Lens	1
31340023A	22	Cover, Lens	1
31340023A	23	Cover, Lens	1
31340023A	24	Cover, Lens	1
31340023A	25	Cover, Lens	1
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31340023A	31	Cover, Lens	1
31340023A	32	Cover, Lens	1
31340023A	33	Cover, Lens	1
31340023A	34	Cover, Lens	1
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31340023A	61	Cover, Lens	1
31340023A	62	Cover, Lens	1
31340023A	63	Cover, Lens	1
31340023A	64	Cover, Lens	1
31340023A	65	Cover, Lens	1
31340023A	66	Cover, Lens	1
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31340023A	97	Cover, Lens	1
31340023A	98	Cover, Lens	1
31340023A	99	Cover, Lens	1
31340023A	100	Cover, Lens	1



EXPLODED VIEW

MODEL AP-120

AC ADAPTOR SECTION

1. GENERAL

The Hitachi AP-120 is an AC adaptor designed for the Hitachi KP-120 solid-state black-and-white camera only.

This model cannot be used for other cameras.

2. SPECIFICATIONS

Usable camera:	Hitachi KP-120 solid-state black-and-white camera
Power requirements:	117 V AC, 60 Hz, 8 W
Output voltage:	DC 9 V, 300 mA
Dimensions:	74(W) x 60(H) x 100(D) mm (excluding rubber feet)
Weight:	0.8 kg

3. NAMES OF PARTS

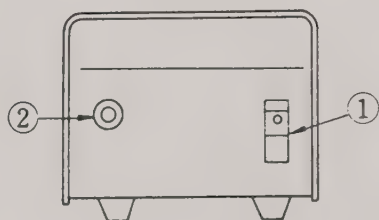


Fig. 1

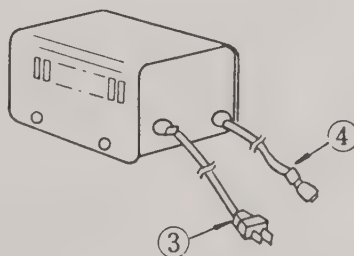


Fig. 2

- ① Power switch
- ② Power lamp
- ③ Power cord
- ④ Camera connection cable

This supplies DC voltage to the camera.

4. CIRCUIT DESCRIPTION

This AC adaptor employs a regulator circuit of a series feed-back type which has a current limiting protector circuit, and delivers 9 VDC, 300 mA power.

The voltage is detected by transistor Q4 with the voltage of zener diode D5 as a reference, and controls Darlington connected transistors Q2 and Q3 to obtain a constant voltage.

Transistor Q1 is a constant-current circuit using the self bias and it acts as the load impedance of transistor Q4.

When the load is shorted or an overload results, transistor Q5 detects the voltage drop in resistors R3 and R4, and it limits the current of control transistor Q2 since it serves as a protection circuit. The limiting current is determined by resistors R3 and R4 and set at 330 mA for this particular model.

Variable resistor VR1 is used to adjust the 9 V output voltage.

5. REPAIRS

- (1) When the power lamp does not light

A rectifying voltage (16.5 V with rated input and rated load) is not fed out. Check power transformer T1 and diodes D1 through D4.

A guideline for a disconnection or shortcircuit in power transformer T1 is 100 ohms for the primary and 4 ohms for the secondary.

- (2) When the power lamp lights

- a) High output voltage or no output voltage

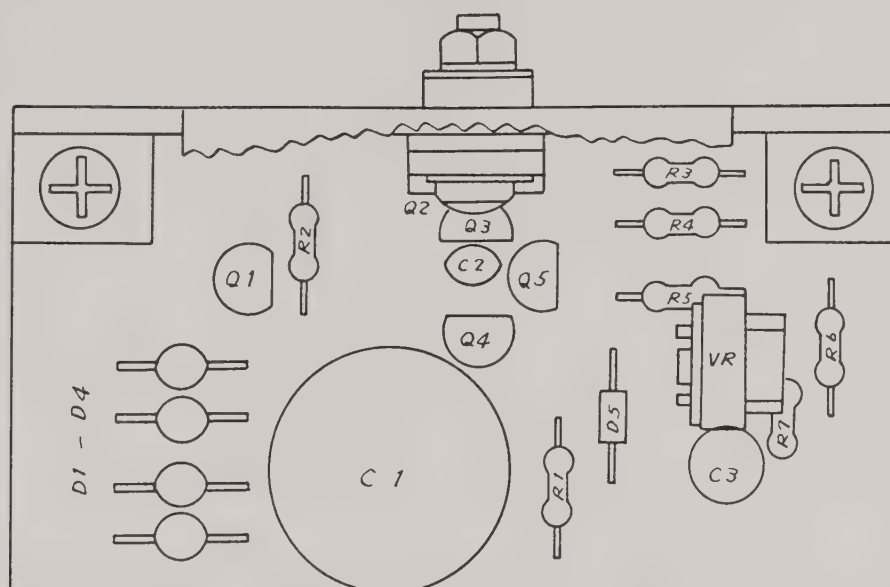
Check transistors Q2-Q4 and diode D5.

- b) Much ripple

Check transistor Q1.

The output voltage will not be fed out if transistor Q5 has failed or if there is a shortcircuit in the connected camera power line.

6. ELECTRICAL PARTS ARRANGEMENT



7. ELECTRICAL PARTS LIST

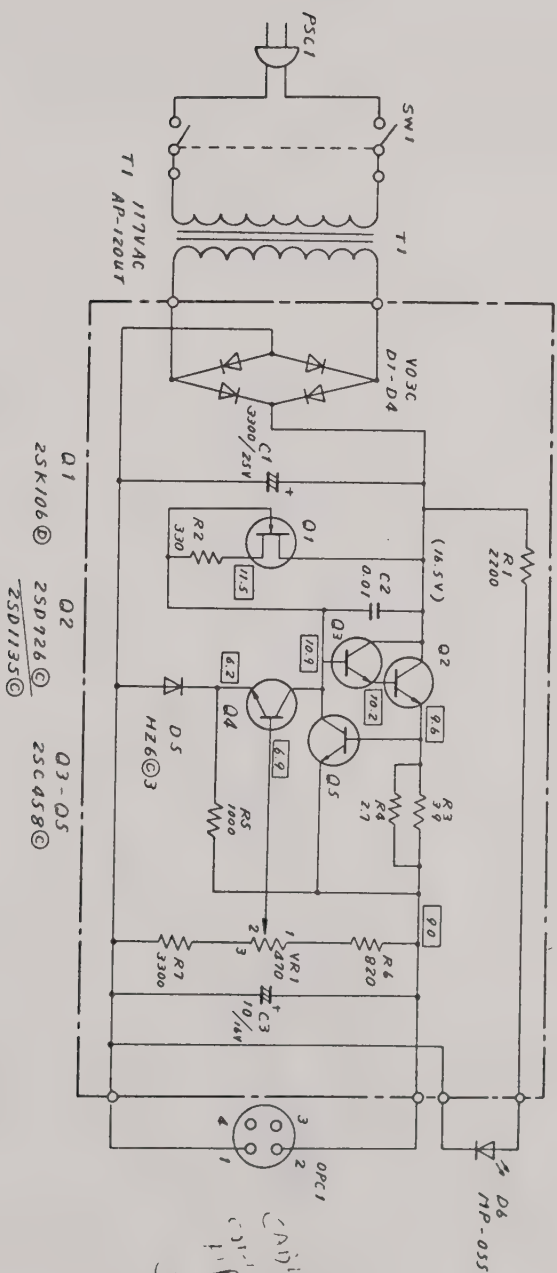
PCB

Part Code	Symbol	Description			Remarks
<u>Transistors</u>					
HTK0062	Q	1	2SK106-D		
HTD0073		2	2SD1135-C		
HTC0148		3	2SC458-C		
"		4	"		
"		5	"		
<u>Diodes</u>					
HDV0013	D	1	V03C		
"		2	"		
"		3	"		
"		4	"		
HDH0034	5	HZ6C3			
<u>Resistors</u>					
RCR4924	R	1	Carbon	1/4W	2.2k Ω $\pm 5\%$
RCR4925		2	"	"	330 Ω "
RCR4926		3	"	"	3.9 Ω "
RCR4927		4	"	"	2.7 Ω "
RCR4921		5	"	"	1000 Ω "
RCR4923		6	"	"	820 Ω "
RCR4922		7	"	"	33k Ω "
<u>Var. Resistor</u>					
RNH0001	VR	Metal		470 Ω	
<u>Capacitors</u>					
CES0100	C	1	Elve	25V	3300 μ F
CCX0160		2	Ceramic	50V	0.01 μ F
CES0101		3	Elve	16V	10 μ F
<u>Printed Circuit Board</u>					
PPT0011		PCB	T-P6-3034	UL 94V-0	

CHASSIS

Part Code	Symbol	Description	Remarks
HDM0093	LED	<u>Diode</u> MP-055 RED	
UPA0006	PC	<u>Miscellaneous</u> PCB ASSY	
BBZ0226	PSC	Power cord T-M6-4041 125V 7A	J type
BBZ0227		" T-M6-4042 125V 10A UL	U type
HRF0217		Cord (Output) T-M6-4043	
SSS0091	SW1	Power Switch SDE3SB1	J type
SSS0094		" SDE3SB1 UL CSA	U type
TTA0012		Transformer AP-120JT	J type
TTA0013		" AP-120UT	U type

8. SCHEMATIC DIAGRAM



10067

9. MECHANICAL PARTS LIST AND EXPLODED VIEW

Part Code	Symbol	Quantity	Description	Remarks
31428732A	1	1	Chassis	
83420816A	2	2	Bracket, Screw	
83420817A	3	3	Heat Sink	
83420818A	4	4	Power, Power	
83420819A	5	5	Power, Power	
83420820A	6	6	Power, Power	
83420821A	7	7	Power, Power	
83420822A	8	8	Power, Power	
83420823A	9	9	Power, Power	
83420824A	10	10	Power, Power	
83420825A	11	11	Power, Power	
83420826A	12	12	Power, Power	
83420827A	13	13	Power, Power	
83420828A	14	14	Power, Power	
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83420830A	16	16	Power, Power	
83420831A	17	17	Power, Power	
83420832A	18	18	Power, Power	
83420833A	19	19	Power, Power	
83420834A	20	20	Power, Power	
83420835A	21	21	Power, Power	
83420836A	22	22	Power, Power	
83420837A	23	23	Power, Power	
83420838A	24	24	Power, Power	
83420839A	25	25	Power, Power	
83420840A	26	26	Power, Power	
83420841A	27	27	Power, Power	
83420842A	28	28	Power, Power	
83420843A	29	29	Power, Power	
83420844A	30	30	Power, Power	
83420845A	31	31	Power, Power	
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83420861A	47	47	Power, Power	
83420862A	48	48	Power, Power	
83420863A	49	49	Power, Power	
83420864A	50	50	Power, Power	
83420865A	51	51	Power, Power	
83420866A	52	52	Power, Power	
83420867A	53	53	Power, Power	
83420868A	54	54	Power, Power	
83420869A	55	55	Power, Power	
83420870A	56	56	Power, Power	
83420871A	57	57	Power, Power	
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